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# Sex Ratios Produced in the Kemp's Ridley Recovery Program

Ashley Stephens, Thane Wibbels

The Kemp's ridley sea turtle possesses temperature dependent sex determination (TSD) in which the incubation temperature of the egg determines sex. This means that the ratio of males to females can vary each nesting season and can lead to possible advantages and disadvantages for the recovery of the species. The Kemp's ridley is an endangered species and many conservational programs such as the Kemp's Ridley Recovery Program at Padre Island National Seashore are working to save this turtle. Monitoring the sex ratios of the Kemp's ridleys produced at Padre Island can allow scientists to better evaluate and potentially enhance the recovery of this species. In this study of sex ratios, 30% of the nests from the 2006 nesting season were examined using histological techniques. It was found that out of 220 hatchlings, 135 were females, 24 were males, and 55 were unknown due to the decomposition of the tissue. These results showed a strong female bias. Since the Kemp's ridley is an endangered species, a female bias could be very beneficial in the recovery of the population as long as the males do not become limiting.

## INTRODUCTION

The Kemp's ridley turtle (*Lepidochelys kempii*) is one of the most endangered sea turtles (Bolten et al., 2003). They are mostly found in the Gulf of Mexico, but are also found along the Atlantic coast as far as Massachusetts (Magnuson et al., 1990). Kemp's ridley (*Lepidochelys kempii*) is one of several turtle species that undergoes temperature-dependent sex determination (TSD) (Wibbels, 2003). Cooler incubation

temperatures will produce males, and warmer temperatures will produce females. (Wibbels, 2003). Many factors such as temperature, rainfall, and seasonal changes can affect the sex ratios. Knowing the pivotal temperature and transitional range of temperatures (TRT) can be very useful for conservational purposes (Wibbels, 2003). This information can allow the sex ratios to be predicted and can be changed if necessary to improve reproductive output and increase the population. The majority of Kemp's ridleys nest near Rancho Nuevo, Mexico, but an increasing number of turtles are now nesting in Texas.

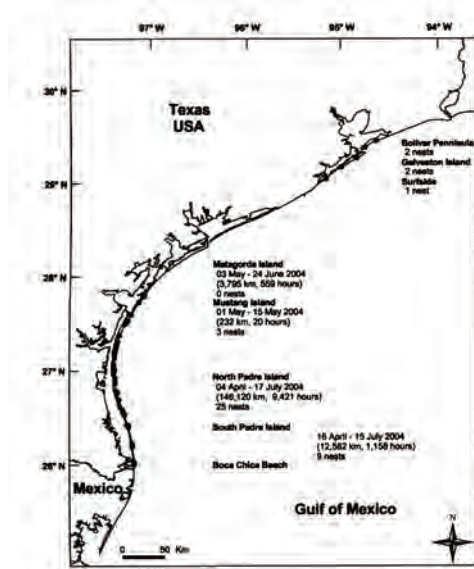
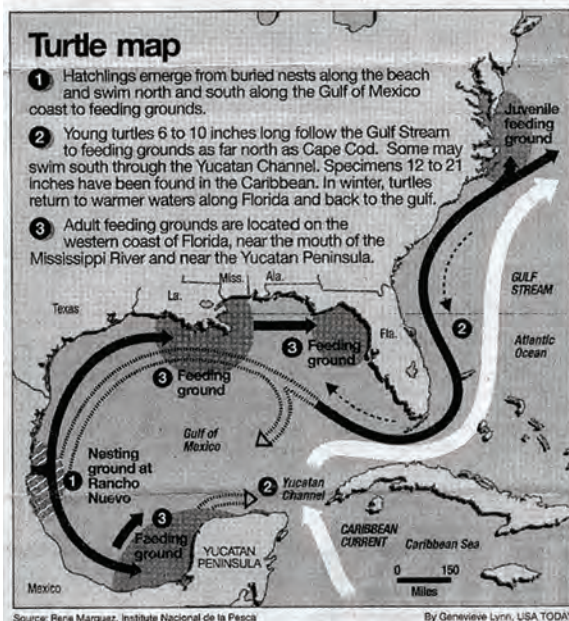


Figure 1. Maps depicting Kemp's Ridley Range and Nesting Beach.



**Figure 2. The Kemp's Ridley turtle is the most endangered species of all sea turtles. It possesses temperature-dependent sex determination.**

The Kemp's Ridley Recovery Program at Padre Island National Seashore is currently working to enhance the survival of hatchlings from nests laid in Texas.

The purpose of this project was to evaluate sex ratio produced by the Padre Island Kemp's Ridley Recovery Program during the 2006 nesting season. Determining the sex of the hatchling externally is impossible. The only way is to examine the gonad internally (Wibbels, 2003). For the purposes of this experiment, the hatchlings that were found dead in the nests were evaluated histologically to determine sex and predict sex ratios (Humason, 1972).

#### MATERIALS AND METHODS

Each year after nests have hatched, the ones that did not survive are sent to the lab for observations. After the dead hatchlings have been and sent to the lab, the gonad and a portion of the kidney are dissected out. The gonad tissue goes through an infiltrating process consisting of ethanol and toluene (Humason, 1972). It will then be imbedded in a small block of hot paraffin wax to prepare for sectioning. The block is then allowed to harden. During the sectioning process, the excess wax is trimmed around the gonads so that there is a

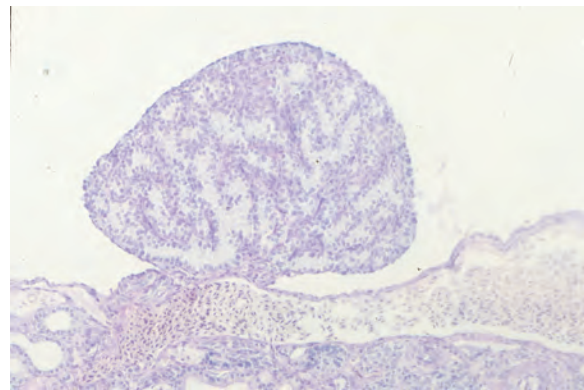
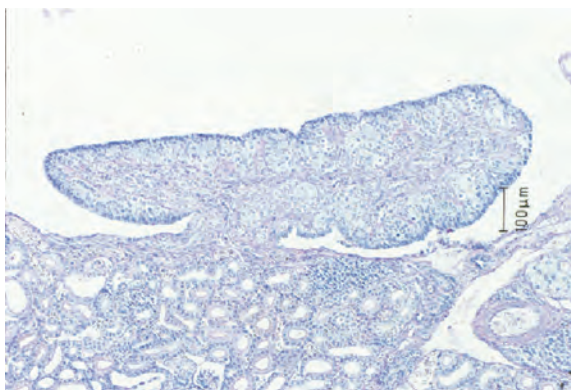
small portion containing the gonads is showing. The block is placed on a rotary microtome and thin ribbons of the gonad are sectioned out and placed on microscope slides. Water is used to allow the wax to stay on the slides. After five to ten slides are made, they are then placed on hot plate in which they will stay for 24 hours to dry. The slides are then ready to be stained.

The staining process consists of several chemicals including hematoxylin and eosin (Humason, 1972). There is a step-by-step procedure using Ethanol, Scott's Solution, Xylene, and water in which the slides must go through in order to dissolve the wax so that they are able to stain. After the staining, they must go through another process where the water is removed so that they may be cover slipped using the permount glue.

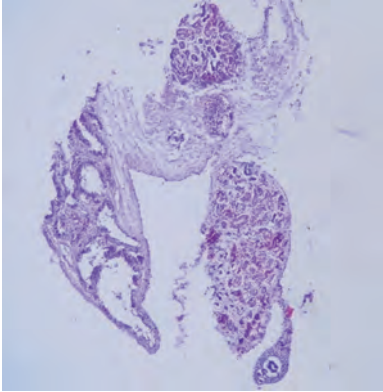
Once the slides have been stained and cover slipped, they are now ready to be examined under the microscope. There are different characteristics that the observer is looking for in order to be able to sex the turtles. A female has a very dark cortex with a prominent oviduct while the male contains seminiferous tubules and lacks a dark cortex and the well developed oviduct (Wibbels, 2003). After all the slides have been viewed under the microscope, the data is recorded for the nest and a sex ratio can then be determined.

#### RESULTS AND DISCUSSION

Hatchlings from approximately 30% of the nests at Padre Island were examined for the 2006 year. Hatchlings from 30 nests were examined. The number of hatchlings in each nest ranged from 1-18 totaling 220 hatchlings. Of the 30 nests, 27 had female biased sex ratios and 3 had male biased sex ratios. Of the total of 220 hatchlings examined, 135 were females, 24 were males, and 55 were unknown. These results showed a strong female bias. This means that the incubation temperatures were relatively high at Padre Island in 2006. The numbers of unknowns were due to the tissue being too decomposed to distinguish since the turtles probably died several days before the live hatchlings emerged.



**Figure 5. Histological sections of hatchling sea turtle ovary (left) and hatchling testis (right). The ovary has a well-developed outer cortex which stains heavily and a regressing inner medulla. In contrast, the testis lacks a distinct cortex, and the medulla has well-organized groups of cells that form the seminiferous tubules.**

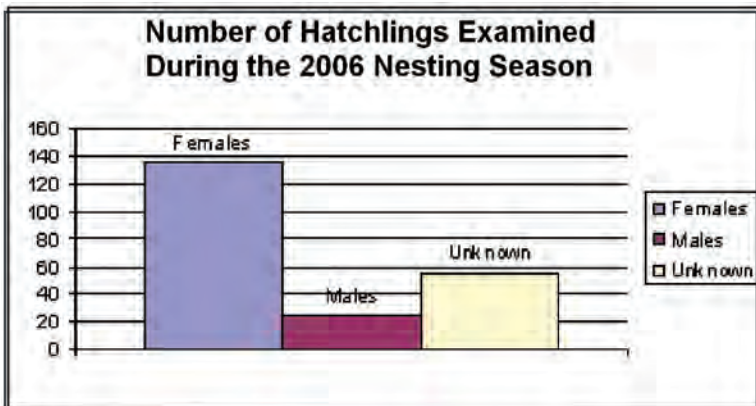


**Figure 6. Example of decomposed tissue. The sex can not be determined from such tissues.**

Having a gender biased population could have significant conservation implications for the Kemp’s ridley. It may be advantageous to have a female bias as long as the males do not become limiting. The female bias could increase egg production in future years after these hatchlings mature. This could speed up the recovery of this species. These data suggest that the sex ratios produced in the Padre Island Kemp’s Ridley Recovery Program represent an advantageous outcome for the recovery of this endangered sea turtle.

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**Figure 7. Graph Showing the Number of Hatchlings Examined From the Padre Kemp’s Ridley Recovery Program During the 2006 Nesting Season.**